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Employment Outcomes and PTSD Symptom Severity

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A diagnosis of chronic war-related posttraumatic stress disorder (PTSD) has been linked consistently to poor employment outcomes. This study investigates the relation further, analyzing how symptom severity correlates with work status, occupation type, and earnings. Study participants were male Vietnam veterans with severe or very severe PTSD who received treatment in the Department of Veterans Affairs system ($N = 325$). Veterans with more severe symptoms were more likely to work part-time or not at all. Among workers, more severe symptoms were weakly associated with having a sales or clerical position. Conditional on employment and occupation category, there was no significant relation between PTSD symptom level and earnings. Alternative PTSD symptom measures produced similar results. Our findings suggest that even modest reductions in PTSD symptoms may lead to employment gains, even if the overall symptom level remains severe.

KEY WORDS: posttraumatic stress disorders; employment; income; Veterans; Veterans hospitals; mental health services.

Posttraumatic stress disorder (PTSD) is a debilitating condition marked by numbing and avoidance, hyperarousal, and re-experiencing of traumatic events. Although popularly associated with combat veterans, PTSD affects a wide cross-section of the population. The National Comorbidity Survey yielded a lifetime prevalence of 7.8% among Americans ages 15–54 (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995).

The disorder is particularly common among military veterans. Nearly 1 million male Vietnam-era veterans have experienced PTSD, and half continued to have the condition as of 1990 (Kulka et al., 1990). Hundreds of thousands more experienced PTSD as a result of World War II and the Korean conflict. In the National Comorbidity Survey, nearly 58% of male veterans reporting combat trauma had a diagnosis of PTSD in which the combat trauma was the only or the most distressing traumatic event (Kessler et al., 1995).

PTSD is strongly associated with poor work outcomes among Vietnam-era veterans. Using data from the National Survey of the Vietnam Generation, Savoca and Rosenheck (2000) found that a lifetime diagnosis of PTSD was associated with a nearly 50% lower probability of current employment. A similar outcome was obtained by McCarren et al. (1995) in a study of monozygotic twins. In the National Vietnam Veterans Readjustment study, Zatzick et al. (1997) found that men diagnosed with PTSD were more than three times as likely to be out of work. The relation of PTSD to wages and hours worked is less clear. Savoca and Rosenheck (2000) found that PTSD was associated with lower wages but not with fewer hours per week. PTSD was not significantly associated with different occupation groups among pairs of veteran twins (McCarren et al., 1995).

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Although the average impact of a PTSD diagnosis is substantial, the range of symptoms levels and consequent impairment is quite large. Treatment aims to reduce symptoms and ameliorate their impact on daily life. Because patients may have severe symptoms for long periods of time, it becomes important to know how clinical and socioeconomic outcomes vary across symptom types and levels, rather than simply between having and not having the diagnosis.

This paper investigates whether the level of symptoms relates significantly to three major employment outcomes. It contributes to the understanding of mental illness and work in several ways. To our knowledge, it is the first to test whether variations in symptom levels affect work outcomes in a population of PTSD patients. By now it is well established that veterans diagnosed with PTSD have worse outcomes than those without the disorder; this paper goes further by assessing whether the degree of severity matters as well in a population with severe and very severe symptoms. If so, it would imply that therapies having a moderate impact on symptom levels but not producing remission might still confer substantial gains to patients. This is also the first paper to compare three measures of PTSD symptoms in the same population with respect to work outcomes. Differences among them in phrasing and mode of administration could lead to different assessments of the link between symptom levels and work outcomes.

METHODS

Participants

Our data derive from a randomized trial of competing group therapies for PTSD conducted by the Department of Veterans Affairs (VA). The study, known as "CSP 420," enrolled 360 male Vietnam-era veterans with severe or very severe PTSD symptoms at 10 VA medical centers. Patients were randomized into either trauma-focused or present-centered group therapy sessions. They received weekly therapy for 30 weeks followed by five monthly booster treatments. Data were collected at baseline and at five later points. Patients were excluded if they had lifetime or current psychotic disorders or bipolar disorder, current major depression with psychosis, very low cognitive ability, or cardiovascular disease that prevented participation in group therapy sessions. Personality disorders and current substance *abuse* did not disqualify patients, but patients could not be *dependent* on alcohol or drugs and had to agree to refrain from using them at work and during treatment. Further details of the study design may be found in Schnurr, Friedman, Lavori, and Hsieh (2001) and Schnurr et al. (2003).

For the present analyses we began with the total population of CSP 420 patients. To avoid confounding employment and retirement decisions, we excluded study participants ages 55 and older. This yielded a final sample size of 325. Approval for our analyses was obtained from VA and IRB committees.

The group therapies that constituted the experimental and control therapies in the parent study could have affected participants' job market outcomes. We therefore chose to use only baseline data from CSP 420 for our analyses. The study participants were not necessarily treatment-naïve, however. Prior to the start of CSP 420, all had at least a provisional PTSD diagnosis. The extent of their previous treatment for PTSD was not recorded.

Measures

Employment

The employment status variable was based on three questions in the parent study. Two questions asked the amount of net earnings and the number of days with paid work in the last month.[7] Transitional, set-aside, and sheltered positions were not excluded, and thus some earnings may derive from noncompetitive positions. The third question asked respondents to classify themselves as employed full-time, employed part-time, retired, unemployed, or other. We defined full-time workers as those who identified themselves as "employed full-time." We defined part-time workers as all others who reported nonzero earnings and at least one day of paid work per week. Those reporting no earnings or no paid days of work were classified as not working.

Roughly 5% of respondents reported earnings but did not indicate either part-time or full-time employment. These may have been people working at odd jobs, for instance. Because our interest was in any employment, even if irregular, we counted those respondents as having part-time work.

[7]Net earnings were self-reported and not verified by other means.

Labor-market analyses typically exclude retired people because they are not searching for work. We chose to include them, however, because the respondents in our analyses were all ages 44–54. In that age range, people reporting retirement are likely to be "discouraged workers," people who would look for work if they believed a search would be successful.

VA offers supported work programs such as compensated work therapy (CWT). These programs offer paid work in settings that integrate people with and without serious mental illness, and supplement work with supportive psychosocial services and, in some cases, housing assistance. Although the parent study did not ascertain whether participants were engaged in VA- supported work programs, the chances were slim: in fiscal year 2001, only 4% of those treated in VA mental health programs participated in VA-sponsored supported work activities (Roswell, 2002). We lacked information on enrollment in federal-state work rehabilitation programs.

The survey also asked about the respondent's usual occupation. Choices were sales, clerical, service worker, craftsman/operative/laborer, professional/technical/managerial, unemployed, and other. We combined sales, clerical, and service worker into a single category because they have similar education and training requirements. The few people reporting "other" were added to this group as well. People reporting "unemployed" as their usual occupation were excluded because that response does not represent an occupation type. After these changes, the occupation choice variable had three values: craftsman/operative/laborer, professional/technical/managerial, and sales/clerical/service worker/other.

The final employment variable is monthly earnings. Labor economic studies typically analyze daily or hourly earnings, but these could not be calculated from our data. Respondents were not queried about hours of work, and days with work in the past month appeared to be inconsistently reported as well. We therefore analyze monthly earnings, defined in the survey as net earnings from employment in the last 30 days.

PTSD Scales

There were three measures of PTSD symptoms: the Clinician-Administered PTSD Scale (CAPS) (Weathers, Keane, & Davidson, 2001), the Mississippi Scale for Combat-Related Posttraumatic Stress Disorder (Keane, Caddell, & Taylor, 1988), and the PTSD Checklist (Weathers, Litz, Herman, Huska, & Keane, 1993). They differ from one another in the mode of administration, length, and phrasing.

The CAPS is administered through a structured clinician-administered interview covering the 17 PTSD symptoms delineated in DSM-IV plus eight associated symptoms (Weathers et al., 2001). The range of possible scores is 0–120. The CAPS has excellent psychometric properties. A recent review reported internal consistency, intraclass correlation (between raters), and convergent validity estimates generally over .80, and many over .90 (Weathers et al., 2001). A score of 60 or greater is considered severe PTSD, and 80 or greater, very severe. The mean score of our sample was 81.6 ($SD = 18.4$).

The PTSD Checklist is a self-administered questionnaire. It asks to what extent the respondent has been bothered by the 17 PTSD symptoms given in DSM-IV, rated from "not at all" (1 point) to "extremely" (5 points). The range of scores is thus 17–85. Weathers et al. (1993) tested the scale on a sample of male Vietnam-era veterans. Using the most efficient cutoff score (50), they found the scale to have excellent test-retest reliability (.96), internal consistency (.97), and convergent validity with the Mississippi Scale (.93).

The Mississippi Scale is also self-administered. It presents 35 first-person statements that reflect PTSD symptoms and asks for their applicability (from "never" to "very frequently" or from "not at all true" to "extremely true"). Questions are scored from 1 to 5, with higher scores corresponding to worse symptoms. The range of scores is thus 35–175. A typical cutoff score for a diagnosis of PTSD in veterans is 107, although lower scores have been used in some studies (Rosenheck, Frisman, & Sindelar, 1995; Zatzick et al., 1997). The Mississippi Scale has high test-retest reliability (.97), sensitivity (.93), and specificity (.88) (Keane et al., 1988).

We chose to use the CAPS as our primary PTSD measure for several reasons: it is observer-rated, closely matches the DSM-IV criteria for PTSD, and has excellent psychometric properties. The self-rated PTSD Checklist and Mississippi Scale do not capture quality of life as thoroughly as the CAPS. Self-administered scales also face the difficulty that patients may differ in their interpretations of the questions. By contrast, clinicians who administered the CAPS were carefully trained, monitored, and given

refresher training, yielding high interrater reliability (Schnurr et al., 2001).

Blake et al. (1990) found a correlation of .42 between CAPS score and combat exposure score in a cross-section of persons with PTSD. In our sample, however, the correlation was only 0.15 ($p < 0.01$). This is sufficiently low to conclude that the CAPS and combat exposure scores were not measuring a single domain. The low correlation in our sample most likely stems from its homogeneity: all study participants had severe or very severe PTSD.

CAPS Subscales

The CAPS is designed to allow separate measurement of three symptom clusters: reexperiencing (5 questions), avoidance and numbing (7 questions), and hyperarousal (5 questions). The total CAPS score is the sum of the three subscale scores. Descriptive statistics for the total CAPS and its component subscales are presented below, to determine whether working and nonworking study participants had similar characteristics.

Other Variables

A veteran who sustains an impairing injury during military service is entitled to compensation. Veterans who experience PTSD after military service ends are entitled to compensation if the service record clearly indicates traumatic situations that could lead to PTSD. Veterans seeking compensation undergo clinical examination and, if the claim is found valid, receive a disability rating. Ratings range from 0–100% by decile, with higher values corresponding to greater impairment. A rating of at least 10% entitles the veteran to a monthly pension and to free treatment at VA healthcare facilities for service-related conditions, or for all conditions if there is a disability rating of 50% or greater. A 0% rating means that a service-connected injury exists but does not cause impairment. This entitles the veteran to VA health care for the service-related injury, but no disability payments are made. Although veterans may have disability ratings for multiple causes, in our sample nearly all ratings were based entirely or almost entirely on PTSD.

Because a disability rating may lead to regular payments, the disability rating enters our analyses as a measure of unearned income. Not all disabled veterans apply for disability ratings, but for those who do so successfully, the pension may discourage work or lead to fewer hours of work per month. Moreover, some veterans with 100% ratings will face reduced benefits if they work. The determining factor is whether the 100% rating is due to impairment alone (such as the total loss of sight) or from a lesser impairment that nonetheless is likely to preclude work. From our data we cannot tell which category veterans with 100% ratings fall into.

Remaining variables include demographic characteristics, education, and combat exposure rating. Demographic characteristics included age and race. Patients were grouped into two race categories, Black and Non-Black, because Whites and members of other racial groups had similar coefficients in early regression analyses. Race is represented in the analyses by the binary (0/1) variable Black. Years of completed education was coded as three binary (0/1) variables: 0–12 years, 13–16 years, and more than 16 years. (Two people reporting their education level as "other" were placed in the 0–12 category.) The categories, which correspond to high school/GED or less, college, and professional or graduate school, reflect distinctions correlated with employment income in the general population. We could not enter education as a continuous variable because the underlying survey offered only descriptive choices, such as "grade school or less" and "high school graduate/GED."

Combat exposure was measured through seven questions, such as "How often did you fire rounds at the enemy?" and "Did you ever go on combat patrols or have other dangerous duty?" Each question had five potential responses. The lowest score (1 point) corresponded to no exposure to the experience described. The highest score (5 points) corresponded to the greatest level of exposure, which varied by question (e.g., "51+ times"; "7+ mos."). Our combat exposure variable was the unweighted sum of scores for the seven questions, with a range of 7–35.

Analysis

We begin by presenting descriptive statistics for outcome and explanatory variables in the regression models. Separate figures are presented for those working and not working at baseline. Differences across groups were assessed using chi-square tests for binary variables and *t*-tests for continuous variables.

The first regression analysis models the probability of work in an ordered logit framework. PTSD symptoms may affect the choice of occupation among those who work. A desire to avoid situations that trigger reexperiencing, numbing, emotional withdrawal, and hyperarousal may all limit the range of feasible and desirable occupations. We next estimated a multinomial logit model of occupation choice to assess whether the level of PTSD symptoms affect occupation choice within our sample.

Even controlling for work status and occupation category, there may be residual effects of PTSD symptoms on earnings, for example due to job tenure or performance. The third regression analysis modeled monthly earnings. Because models with logged earnings typically exhibit a better model fit, we estimated the earnings models separately for raw and logged earnings.

Specification of Earnings Models

Earnings depend on the decision to work as well as the number of hours worked. There are therefore two approaches to modeling earnings. One is to include all respondents, including nonworkers. A single model is used to predict both the likelihood of working and, conditional on work, the level of earnings. The more common approach is to model the probability of work separately from the level of earnings. Workers may differ from nonworkers in poorly observable characteristics, such as motivation or productivity. As a result, an earnings model based on workers may inaccurately predict earnings for nonworkers. The solution is to account for selection into the pool of workers. Because some factors determining work may be unobserved, the best approach is one proposed by Heckman (1976).

A standard formulation of the Heckman model has two steps. In the first step we model the probability of working among all people in the sample ($N = 325$). The predicted probability for each person is saved and transformed into an inverse Mills ratio (see Greene, 1993, p. 711). The second step is a linear regression model of earnings, estimated on the subsample of earners ($N = 110$). The inverse Mills ratio appears as a regressor in this equation, tying together the first and second steps. Other variables in our earnings model were demographics, labor market factors, occupation, and CAPS total score.

In order to provide adequate statistical identification for the two-step model, there must be variables that predict participation but do not predict earnings. The identifying variables enter as regressor in the first stage (probability model) but not the second stage (earnings model). We tried two sets of identifying variables: unemployment rate and combat exposure for models including all workers, and those two variables plus disability rating and its square for models of full-time workers alone. Disability could be used an identifying factor in the models of full-time workers because it is unrelated to earnings for that group.

Independent Variables

Following the standard approach in economics, our models used reduced-form specifications that included factors theorized to affect both labor supply and labor demand. Age and race (Black vs. Non-Black) are strongly correlated with labor force participation and earnings (U.S. Census Bureau, 2002). We expected combat exposure, measured on a continuous scale (range 2–41), to be significantly correlated with labor force participation (Prigerson, Maciejewski, & Rosenheck, 2002). Its relation to occupation choice and earnings is uncertain. PTSD symptoms were measured by the CAPS score. Alternative models were run using the PTSD Checklist and the Mississippi Scale to determine whether the choice of PTSD scale affected the outcome.

Current substance abuse and current depression were excluded from the regression models. Although many studies have found a connection between substance abuse and employment (Mechanic, Bilder, & McAlpine, 2002; Savoca & Rosenheck, 2000), the most severe cases are likely people who are substance-dependent rather than simply substance abusers. People who were dependent on alcohol or drugs were excluded from the study, and those who remained agreed to refrain from substance use during therapy or work. Depression has likewise been linked to reduced employment, low work performance, and increased disability days (Berndt et al., 1998; Broadhead, Blazer, George, & Tse, 1990; Savoca & Rosenheck, 2000). The direction of causality is unclear, however. Depression could cause decreased employment due to less effective job searching or dismissal for low productivity. Depression could also follow from an inability to find adequate work and the consequences of reduced income. Because of this potential endogeneity, we did not include an indicator for depression diagnosis.

Labor demand was represented by several variables. First was the unemployment rate in the patient's Metropolitan Statistical Area (MSA), as defined by the U.S. Census Bureau. The rate was measured in the quarter in which the baseline data were collected. Education, represented by indicators for 12 years or greater than 12 years of completed schooling, affects labor demand because of the correlation between education and job-related skills. It may also reflect individuals' expectations of and desire for particular occupations or income levels.

The final variables in the models were site indicators and the VA disability rating. The site indicators were used to control for unobserved site-level characteristics that could affect employment outcomes, such as the mix of industries. Disability rating and its square (divided by 100) were used in case disability rating had a nonlinear relationship with the outcomes variables. As noted earlier, disability ratings are proxies for unearned income. Higher levels of unearned income may lead individuals to lower earned income through reduced hours of work. Veterans who had not applied for a service-related disability were assigned a rating of 0%.

Independent variables for the earnings models were similar to those of the work and occupation models, and included demographics, combat exposure, disability rating, and PTSD symptom scores. We added indicator variables to represent the occupation categories, with sales/clerical as the omitted category. The site indicators could not be used in the earnings models. The Heckman model is sensitive to the model specification, and in this case the use of any site indicators caused the models not to converge. Thus, there may be unobserved site-level factors related to earnings—such as the average wage level—affecting our results.

Marginal Effects

We next present results of logistic models, displaying the results as marginal effects rather than the usual odds ratios. Marginal effects have a simple and direct interpretation: the change in the probability of each outcome due to a one-unit change in the independent variable. One-unit changes in binary variables (Black and the education variables) refer to a change from "0" to "1." For age it represents one year; for combat exposure, one point on the scale; for unemployment and disability rating, one percentage point; for disability rating squared over 100, a one-point change in that product; and for the PTSD scales, a one-unit change in the total score.

Two features of marginal effects may seem unusual. First, they can be calculated for all choices, including the base category used in estimation. Thus, there is no "omitted category" in the tables of results. Second, the marginal effects sum to zero across the three choices (except for rounding error) because the choices are exhaustive. For example, all participants must work full-time, part-time, or not at all, and therefore any gain in one category must be exactly offset by losses in the others. Likewise, all workers were grouped into one of the three occupation categories.

RESULTS

Descriptive Statistics

Means and standard deviations of study variables appear in Table 1. Means for binary variables represent the proportion of "1" (yes) values. Separate figures are presented for those with and without work, where work is defined as nonzero earnings and at least one day of paid work in the last 30 days.

We found workers and nonworkers to have similar age, race, and education distributions. Nonworkers had slightly higher combat exposure on average (30.7 vs. 28.1, $p < .05$). As expected, workers reported lower levels of disability. Forty-five percent of workers had a 0% rating (including those with no disability rating at all), versus 28% for nonworkers ($p < .01$). Consequently, there were highly significant differences in the average disability level (range 0–100) and in its square divided by 100 (range 0–100). We found no difference across groups in average unemployment rate in the communities where patients lived.

Table 1 also reports PTSD symptom scale levels. We found statistically significant differences in the CAPS total score, each CAPS subscale, the Mississippi Scale, and the PTSD Checklist. Nonworkers' scores were 8–13% greater on all measures, suggesting that there may be a link between higher scores and a lower probability of work.

The zero-order correlation among the scores was quite high for both workers and nonworkers and always significant at the 99% confidence level (figures not shown). The CAPS exhibited high internal consistency, with correlations of $\rho = .80$ or greater among the subscores and the overall score. The CAPS overall score was correlated with the PTSD Checklist and Mississippi Scale scores in the

Table 1. Descriptive Statistics

Variable	Working ($N = 110$)		Not working ($N = 215$)	
	Mean	*SD*	Mean	*SD*
Age	49.8	2.08	49.7	2.08
Black	0.20	0.40	0.23	0.42
Education ≤12 years[a]	0.33	0.47	0.37	0.48
Education 13–16 years	0.60	0.49	0.57	0.50
Education >16 years	0.07	0.26	0.06	0.23
Combat exposure	28.1	7.55	30.7	7.27**
Disability rating: none or 0%	0.45	0.50	0.28	0.45***
Disability rating (%)[b]	22.7	28.5	47.1	40.4***
Disability rating squared/100[b]	13.2	24.4	38.4	42.0***
Unemployment rate (%)[c]	3.88	1.50	3.74	1.25
PTSD symptom scales				
CAPS total	76.62	18.78	84.09	17.74***
Reexperiencing subscale	20.48	7.02	23.20	6.92***
Avoidance & numbing subscale	31.72	9.58	34.27	8.81**
Hyperarousal subscale	24.42	6.07	26.62	5.97**
Mississippi scale	116.91	20.13	126.70	16.93***
PTSD checklist	58.76	12.73	64.03	10.66***

[a]The not working column includes two people reporting their education level as "other."
[b]Includes zero values.
[c]Unemployment rate is for the metropolitan statistical area surrounding the VA facility where care was received.
**$p < .05$. ***$p < .01$ from tests of difference across work status.

range of 0.56–0.58, suggesting moderate concurrent validity for these self-reported scales.

Probability of Work

Table 2 reports results of the ordered logit model of work. The total CAPS score was significantly related to each category of hours worked. A 10-point rise in the CAPS score, a small but clinically meaningful increase in PTSD symptoms, was associated with an increase in the probability of no work of 5.9 percentage points, a 2.1 percentage-point decrease in the probability of part-time work, and a 3.8 percentage-point decrease for full-time work (all $p < .01$).

Race, education, and disability rating trended toward significance in their relation to work status. A self-report of Black race was positively related to the probability of not working ($ME = 10.7\%$; $p = .10$) and negatively related to full-time work

Table 2. Probability of Work: Marginal Effects From Ordered Logit Models[a] ($N = 325$)

Variable	Prob. of no work		Prob. of PT work		Prob. of FT work	
	ME (%)	*SE*	*ME* (%)	*SE*	*ME* (%)	*SE*
Age	−0.15	1.32	0.05	0.47	0.10	0.85
Black	10.66	6.37*	−4.04	2.61	−6.61	3.85*
Education 13–16 years	−4.93	6.13	1.78	2.24	3.16	3.92
Education >16 years	−25.14	14.00*	6.09	1.98**	19.05	12.56
Combat exposure	0.58	0.37	−0.21	0.14	−0.37	0.24
Unemployment rate	−4.73	5.54	1.69	2.00	3.04	3.56
Disability rating	−0.08	0.26	0.03	0.09	0.05	0.17
Disability rating squared/100	0.61	0.28**	−0.22	0.11**	−0.39	0.18**
CAPS total	0.59	0.18**	−0.21	0.07**	−0.38	0.12**
Pseudo $R^2 = .148$						
Predicted frequency	69.5		14.2		16.3	

[a]PT = part-time, FT = full-time. ME is the marginal effect (dY/dX) of a one-point change in the variable. By construction the marginal effects sum to zero across choices.
*$p < .10$. **$p < .05$. ***$p < .01$.

($ME = -6.6\%$; $p = .09$). Education beyond college (>16 years) had a sizable partial correlation with not working ($ME = -25.1\%$; $p = .08$) and a positive one with part-time work ($ME = 6.1\%$; $p < .01$). It was not related to full-time work at traditional significance levels, however ($ME = 19.0\%$; $p = .13$). As expected, higher disability was associated with fewer hours of work. The disability rating and its square were jointly significant at the 99.9% confidence level ($\chi^2 = 27.4$).

Taken together, their coefficients suggest that at a rating 10% or higher the probability of not working rose as disability level rose, while the probability of working part-time or full-time fell. In particular, each increase of 10 percentage points in the rating (the smallest increment possible) was associated with an average increase of roughly 5.3 percentage points in the probability of not working ($= -0.8\% + 6.1\%$), a decrease of about 1.9 percentage points in the probability of working part-time, and a decrease of about 3.4 percentage points in the probability of working full-time.

Alternative models were estimated using the PTSD Checklist and the Mississippi Scale (results not shown). They had a similar pattern of signs and significance but with smaller coefficients. Marginal effects were again positive for no work and negative for part-time and full-time choices, although the effects were notably smaller than for the CAPS.

Occupation Choice

Results of a multinomial logit model of occupation choice appear in Table 3. The sample was limited to people reporting part-time or full-time work ($N = 110$).

Three variables reached 90% significance in these regressions: CAPS score, education, and unemployment rate. Higher CAPS scores had a negative relation to the probability of being in the crafts/labor category. A 10-point rise in the CAPS was associated with a 6.3 percentage points ($p = .10$) lower chance of being in that category rather than the omitted sales/service/other category, all else equal. Having some college education (13–16 years) was associated with a greater probability of being in a professional/technical job ($ME = 30.7\%$, $p < .01$) and a reduced chance of a crafts/labor position ($ME = -45.3\%$, $p < .01$), relative to having 12 years of education or fewer. Education beyond college had similarly large effects, raising the likelihood of being in a professional/technical job ($ME = 45.1\%$, $p = .09$) and lowering the likelihood of being in a crafts/labor job ($ME = -37.1\%$, $p < .01$).

Next we ran the same multinomial logit models using the alternative PTSD symptom scales. A 10-point increase in the PTSD Checklist score was associated with a lower probability of holding a professional/technical job ($ME = -8.8\%$, $p = .04$). A similar result was obtained for the Mississippi Scale ($ME = -5.5\%$; $p = .04$). Neither scale was significantly related to the other outcome categories.

We found greater CAPS scores trended toward a significant, positive relation to the probability of being in the sales/clerical/other category. One explanation of our finding is that "other" jobs explain the difference; in unreported results, we dropped those observations from the sales/clerical/other category

Table 3. Multinomial Logit Analysis of Occupation Choice ($N = 110$)

Variable	Professional/tech		Crafts/labor		Sales/clerical/other	
	ME (%)	*SE*	*ME* (%)	*SE*	*ME* (%)	*SE*
Age	2.09	2.65	−1.86	2.83	−0.23	0.30
Black	21.40	20.68	−13.02	14.48	−8.37	16.97
Education 13–16 years	30.66	9.65**	−45.34	12.45**	14.67	12.76
Education >16 years	45.10	26.40*	−37.06	7.16**	−8.03	25.62
Combat exposure	−0.17	0.70	0.20	0.79	−0.04	0.85
Unemployment rate	−8.21	5.65	−4.14	7.57	12.35	7.65*
Disability rating	0.77	0.56	−0.67	0.64	−0.11	0.67
Disability rating squared/100	−1.16	0.93	0.80	0.85	0.37	0.91
CAPS total	−0.35	0.28	−0.28	0.34	0.63	0.37*
Pseudo $R^2 = .206$						
Predicted frequency (%)	20.6		34.9		44.5	
Actual frequency (%)	26.4		35.5		38.1	

*$p < .10$. **$p < .05$.

and reestimated the models. The sample size fell from 110 to 87, and the CAPS variable became insignificant across the board, although the marginal effect for the sales/clerical category was still positive ($ME = 0.24\%, p = .62$).

Monthly Earnings

The final results correspond to the log of monthly earnings. Because total earnings depend on the number of hours worked, we estimated two regressions: one for all workers ($N = 110$) and one for full-time workers only ($N = 60$).

As noted earlier, the two-step selection models have a parametric structure that requires an identifying variable in the first step. Unemployment rate and combat exposure together provided only weak identification for the models of all workers ($p = .12$ for test of joint significance), and so those models should be interpreted with caution. Results were better for the models of full-time workers only, where the set of four identifying variables were jointly highly significant ($p = .02$; results not shown).

For all workers, only disability rating had statistically significant coefficients (joint $p < .01$). For full-time workers there were no significant coefficients. CAPS scores were not significantly associated with monthly earnings for all workers ($p = .16$) or for full-time workers ($p = .25$) when controlling for demographics, education, job category, and disability. The relatively low p-values suggest that the insignificance may be due to having too few observations. This cannot be tested with out data, but we did explore two other possible explanations.

Because the impact of CAPS on earnings may work through occupation category, we ran additional two-step models without occupation variables (results not shown). In models with logged earnings, the identification of the first step was either weak ($p > .10$) or unreliable (correlation between the errors of the two stages = 1.0). In models with raw earnings, there was a significant coefficient for graduate education (>16 years of schooling) for all workers ($ME = \$1454.55, p < .01$) and for full-time workers ($ME = \$1331.72, p = .03$). The identification of the model for all workers was weak ($p = .17$), however, and so the results should be treated with caution. The CAPS score was not significant in either model. Thus, it appears that the insignificant relation of CAPS to earnings was not due to having the occupation category variables in the models shown in Table 4.

Another possible explanation was the use of CAPS rather than the PTSD Checklist or Mississippi Scale. We therefore reestimated the models in Table 4 using those variables (results not shown). The two-step model using PTSD Checklist and logged earnings was adequately identified and yielded an insignificant coefficient on the PTSD symptom scale ($p = .15$). The same model using the Mississippi Scale and logged earnings could not be estimated reliably. The correlation between the first and second stages was 1.0, a value that suggests that the model was not properly identified. We therefore have no evidence that the insignificant result for the CAPS score in Table 4 is due to the choice of PTSD symptom measure.

Table 4. OLS Analysis of Logged 30-Day Earnings[a]

	All workers		Full-time workers	
Variable	% change	*SE*	% change	*SE*
Age	−0.072	0.061	0.064	0.046
Black	0.239	0.313	−0.025	0.224
Education 13–16 years	0.111	0.268	−0.127	0.192
Education >16 years	0.390	0.520	0.202	0.353
Crafts/trade job	−0.231	0.169	0.043	0.150
Professional/technical job	−0.079	0.208	0.284	0.196
Disability rating	0.032	0.013**	—	—
Disability rating squared/100	−0.019	0.018	—	—
Baseline CAPS score	0.010	0.007	0.006	0.005
No. obs.	110		60	
χ^2	20.62 ($p = .02$)		4.84 ($p = .68$)	

[a]Figures in log of 2000 US dollars. Models also included intercept term and indicators for study sites. Results of selection equations not shown.

*$p < .10$. **$p < .05$.

DISCUSSION

We have assessed how work outcomes relate to PTSD symptom scores in a group of male Vietnam-era veterans with severe or very severe PTSD. We find the strongest correlation between symptom levels and the probability of work, including the distinction between part-time and full-time work. There was a significant but small association with job category as well when we grouped jobs into three broad classifications: professional/technical, crafts/labor, and sales/clerical/other. Controlling for labor force participation and job category, there was no additional connection between PTSD symptom scores and monthly earnings. These results are consistent with studies that have compared veterans with PTSD to those without it (McCarren et al., 1995; Prigerson et al., 2001; Savoca & Rosenheck, 2000). To our knowledge, no other study has analyzed the impact of symptom severity on employment outcomes in a population of persons with PTSD.

Among workers, higher CAPS scores were weakly correlated with a higher probability of employment in the sales/clerical/other category. This is consistent with the pattern noted by McCarren et al. (1995). Among monozygotic twins discordant for PTSD, they found that 13.0% of the twins with PTSD held sales/clerical jobs versus 8.2% of twins without PTSD. When we dropped the 23 people in the "other" subcategory, however, the CAPS score was no longer significantly related to occupation. The high p-value (0.62) implies that the result was not likely due just to the decrease in sample size. We conclude that there is insufficient evidence in our data to suggest that PTSD symptom severity correlates with job category.

When several symptom scales exist for a single condition, a natural question is whether they capture the same domains and whether they have the same utility for statistical analyses. Here we made a limited attempt to compare three major scales: the CAPS, the PTSD Checklist, and the Mississippi Scale. Regression results were similar despite only moderate correlation between the CAPS and the two remaining scales. As expected, the choice of scales appears unlikely to affect the results of work-related outcomes studies.

The connection between disability ratings and work status was similar to that found in an earlier study of Vietnam-era veterans. Rosenheck et al. (1995), using a nationwide 1987 survey of veterans, found that each additional $100 per month in veterans' disability benefits was associated with a 2-percentage-point decline in labor force participation (i.e., having or looking for work). In our sample, each 10-percentage-point increase in disability rating (equivalent to $150–200 per month with inflation adjustment, depending on disability level) was associated with a 5.3-percentage-point rise in the probability of not working and a 1.9-percentage-point rise in the probability of working part-time.

As expected, educational attainment had a significant relation to occupation choice. Education beyond high school was associated with a substantially greater likelihood of holding a professional/technical job. The role of unobserved person-level factors in the choice of education level cannot be known. Nevertheless, the strength of the finding suggests that it would be valuable to conduct a pre/post analysis of education programs for persons with severe PTSD.

Limitations

This study has several limitations. The study population is quite select: Vietnam-era male veterans with severe or very severe PTSD symptoms. Patients having a history of psychotic disorders or who were currently drug- or alcohol-dependent, had serious cardiovascular problems, or who had very low cognitive ability were excluded. As a result, results presented here may not be fully generalizable to all male veterans, female veterans, or nonveterans. The patient population was also limited to people seeking treatment at VA. This may have little effect in practice, however, because VA has expertise in and specialized treatment services for PTSD unmatched by other public or private providers. Income data were limited to earnings, thereby missing earnings from spouses and other householders that may affect both labor force participation and hours of work. Furthermore, some earnings may have derived from noncompetitive employment programs limited to veterans.

A general limitation of cross-sectional studies applies as well. Because there may be unobserved individual characteristics that affect both PTSD symptoms and employment outcomes, cross-sectional data cannot reveal a causal link between the two with certainty. Such factors could include traumatic events prior to military service, neurological attributes, and personality type. A stronger case for the relation of symptom levels to employment outcomes could be made using longitudinal data that tracked individuals

over a period of several years. Such a dataset would be difficult to develop, however. Many veterans with PTSD go in and out of treatment and are lost to follow-up for substantial periods.

Finally, it is possible that some participants were engaged in noncompetitive employment programs sponsored by VA or other public agencies. If so, their reports of employment and earnings may inaccurately reflect their true labor-market capabilities. As noted earlier, however, the low coverage rate and time-limited assistance provided by such programs makes it unlikely that many of our study respondents were participating in them.

Policy Implications

The link between employment outcomes and PTSD symptoms remains unclear despite years of research. Our results suggest that ameliorating PTSD symptoms by a relatively small amount could have a notable impact on employment. Yet evidence from earlier studies points to a weak connection. In a study of 52 VA-compensated work therapy programs, Rosenheck, Stolar, and Fontana (2000) found the programs to have no relation to work outcomes over a 4-month period despite a statistically significant reduction in PTSD symptoms.[8] Conversely, some work programs have increased employment outcomes for persons with PTSD without decreasing symptom levels (Lehman et al., 2002). A large, controlled, longitudinal study will be needed to determine how employment outcomes vary with symptom levels.

Even if symptom reduction does raise the probability of employment, maintaining employment may require a coordinated system of psychosocial and medical care. A 1997 report by the National Alliance for the Mentally Ill (Noble, Honberg, Hall, & Flynn, 1997) criticized federal-state rehabilitation programs, asserting that their time-limited services were insufficient to enable many persons with serious mental illness to sustain long-term employment. CWT programs sponsored by VA are often time-limited as well (Drebing, Rosenheck, & Penk, 2001). Although determining the partial effect of symptom reduction would be valuable, the potential for interactions among psychiatric, medical, and work-environment factors suggests that large, longitudinal studies represent the best approach.

Vocational rehabilitation for persons with serious mental illness encompasses a variety of services and approaches. The Employment Intervention Demonstration (EIDP), a multisite vocational rehabilitation program sponsored by the federal Substance Abuse and Mental Health Services Administration, has studied the effectiveness of supported employment, individual placement and support, and other service models for mental health consumers. Some approaches have yielded statistically significant, meaningful improvements in employment outcomes (Cook, 2003; Lehman et al., 2002). Most patients enrolled in the EIDP studies have primary Axis I diagnoses of psychotic or mood disorders, however, and only 5% have PTSD as a secondary diagnosis (Cook, 2003). An important area for future PTSD research is the evaluation of similar programs for persons with PTSD.

Educational attainment was significantly related to occupation type in our models, and occupation in turn affects earnings. As noted earlier, these suggest that educational programs have the potential to increase the earnings of veterans with PTSD. There could be an indirect effect on VA as well. Occupation choice and earnings relate to the probability of having private-sector health care coverage. An issue for further research is whether veterans with serious mental illness reduce their use of VA services when their earned income rises, and the role of private insurance in that decision.

More research is also needed on the relation of PTSD symptoms to employment enabling factors. They could include secure housing, access to private and public transportation, cohabitation with other adults, and the availability of employer-provided health insurance. In our models, these factors were implicitly captured in the estimated coefficients and in the error term. Determining the total impact of variation in PTSD symptoms, however, will require much closer investigation into the impact and interaction of these additional factors.

[8]Work outcomes were measured by the Addiction Severity Index (ASI) composite employment index, which ranges from 0 to 1. Higher scores indicate better outcomes. CWT positions were not included.

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